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B. T. GALLOWAY, Chief of Bureau

FARM METHODS OF APPLYING LAND PLASTER IN WESTERN OREGON AND WESTERN WASHINGTON.

BY
BYRON HUNTER,
Assistant Agriculturist, Office of Farm Management.

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FARM METHODS OF APPLYING LAND PLASTER IN WESTERN OREGON AND WESTERN WASHINGTON.

INTRODUCTION.

Land plaster[a] is now used in western Oregon and western Washington, especially in the Willamette Valley, as a fertilizer for leguminous crops. It is sometimes used on vetch when grown on poor land, but its principal use is on red and alsike clover as a top-dressing. If sown early enough to be dissolved by the rains, land plaster materially increases the yield of all leguminous crops in this section. It gives to clover a green, healthy, vigorous appearance, while untreated clover is often yellowish and sickly looking. When no plaster is used grasses, as well as sorrel and other weeds, have a strong tendency to crowd out the clover. Where the plaster is properly applied, on the other hand, the clover grows rapidly and holds the weeds in check much better.

Land plaster is usually applied in the early spring as soon as the clover sod is dry enough to be run over without being injured. Farmers who pasture their clover in the spring with sheep to retard its development, so that haymaking will occur after the June rains are over, almost invariably apply their plaster during March. But if

[a] Land plaster, or gypsum, is a form of lime in combination with sulphuric acid. It is found as a rock-like mineral deposit in many widely scattered States from New York to California. Formerly it was extensively used in agriculture as a fertilizer for legumes, especially the clovers, but in recent years and in most places it has been quite generally superseded by other forms of lime or more direct forms of potash fertilizers. Only about one-third of the weight of gypsum is lime; the remainder is sulphuric acid and water. Just what the action of land plaster is in the soil or why it is of such benefit to clover and other legumes is not well understood. Its value is believed, however, to be chiefly due to its indirect effect in setting free plant food already in the soil, especially potash, to its tendency to make the soil alkaline, and to its flocculating effect in heavy clay soils, by which the drainage and mechanical condition of such soils are improved. Its beneficial effect on the clovers may probably be explained by the fact that these crops are preeminently potash feeders and delight in a pervious soil. For a fuller discussion of the action of gypsum, see the revised edition of Storer's Agriculture, vol. 1, p. 334.

applied in the early spring to clover that can not be retarded by pasturing, the crop grows vigorously and matures for hay early in June. Rains are not infrequent at this season and haymaking is often difficult. For these reasons plaster is sometimes applied the last of April or the first of May, so that the crop will mature a little later.

The amount of plaster used varies from 30 to 100 pounds per acre. While some apply as high as 100 pounds per acre, farmers generally agree that from 50 to 60 pounds is sufficient for a hay crop, provided the plaster is evenly distributed. A heavy application causes a growth of too much straw for a seed crop of clover, and from 30 to 40 pounds is generally considered enough by seed growers.

An application of from 30 to 40 pounds of plaster to young clover is very beneficial, as the clover starts better and makes a better stand and a heavier growth in the fall. When clover is sown in the spring with oats or other spring grain, a heavy application of plaster causes the clover to grow too vigorously. Being shaded by the grain, the stems are tall and slender. Under such conditions the hot sun may burn the clover and destroy the stand when the grain is cut. Only light applications of plaster should therefore be made when clover is sown with grain in the spring.

With but few exceptions land plaster is distributed by hand in western Washington and western Oregon. It is distributed either from a sack carried by the sower or from a box or hopper in the back end of a wagon. It is very difficult to sow plaster by hand. Too much is usually applied in the middle and not enough on the margins of each strip sown. The wind blows the plaster and it is very difficult to keep from applying it in streaks. If it is distributed evenly the growth of the crop is quite uniform over the field, but if distributed in streaks the clover also grows in streaks. Where little or no plaster falls, sorrel, grasses, and other weeds often constitute the principal part of the growth. Figure 1 strikingly illustrates the effects of irregular sowing, whether by hand or otherwise.

Uniform distribution of the plaster increases the yield of the crop. It is safe to say that clover yields one-half ton more hay to the acre where the plaster is evenly distributed than where the distribution is uneven. Again, the clover comes on vigorously all over the field and holds the weeds in check much better when the plaster is evenly distributed.

Sowing plaster by hand is very disagreeable. The sower breathes large quantities of the fine dust. It gets into his eyes and all over his person. Few hired men are willing to do the work and the farmer usually has to do it himself. In the attempt to scatter it evenly the sower usually gets on from one and one-half to two times as much as is necessary. This waste amounts to from 20 to 50 pounds per acre.

The difficulties of sowing land plaster by hand can be partially overcome by mixing it with two to four times its bulk of dry soil or ashes.

During the past season the writer made a study of farm methods of applying land plaster in the region under discussion. Farmers were found in different localities who have worked out some very satisfactory devices for this purpose. The object of this circular is to describe these implements in order that other farmers may profit by the experience of these men. It is hoped that the descriptions given herewith are sufficiently clear to enable any farmer who is reason-

FIG. 1.—Field showing the effect of land plaster on clover. The dark streaks on each side show the heavy growth of the clover where the plaster was applied. On the light streak in the center of the figure where no plaster was applied the growth of clover was very scant

ably handy with tools, with the assistance of a local blacksmith, to construct at a reasonable cost an efficient implement for distributing land plaster.

KOON'S LAND-PLASTER DISTRIBUTER.

Several years ago Mr. Clarence Koon, of Lane County, Oreg., bought a wheelbarrow grass seeder with which to sow his clover and alfalfa seed. He conceived the idea of remodeling it and converting it into an implement for distributing land plaster. He removed

the seed box and replaced it with a larger and heavier box. The groove in the bottom of the box was made three-fourths of an inch square. The feed holes in the bottom of the groove were made one-half inch in diameter. A ⅜-inch feed rope was used in the box instead of the small one. With a little practice he soon learned to adjust the feed to sow any amount desired. The implement as remodeled did excellent work, but the weight of the box and plaster made it difficult to run by hand. The wheelbarrow was not strong enough to stand this extra weight, so it had to be strengthened where possible. After using this device for two years, Mr. Koon remodeled the box and attached it to a road cart. (See fig. 2.)

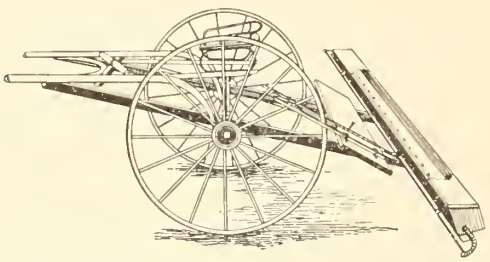

FIG. 2.—An implement for distributing land plaster devised by Mr. Clarence Koon, Lane County, Oreg.

The box, or hopper, for holding the plaster is 14 feet long, outside measurement. The bottom board of the box is 1¼ inches thick and 6¾ inches wide. A rabbet three-fourths of an inch deep and 2¼ inches wide is cut in the upper front edge of the bottom board throughout its entire length. (See fig. 3.) The board forming the front of the box is three-fourths of an inch thick and 5¾ inches wide. The under edge of the front board is nailed to the middle of the rabbeted edge of the bottom. This leaves a groove three-fourths of an inch square in the bottom of the box at its front, and a lip three-fourths of an inch wide on the outside, upon which the bow slides. In the bottom of the groove are half-inch holes 3 inches apart, through which the plaster passes as it is being distributed. The groove is covered with a piece of heavy galvanized iron 2½ inches wide. On the front side of this strip of galvanized iron rectangular holes or notches three-fourths of an inch wide and 1 inch long are cut. The notches are 3 inches apart from center to center. The strip of galvanized iron is so placed in the bottom of the box that the notches come midway between the half-inch holes in the bottom of the groove.

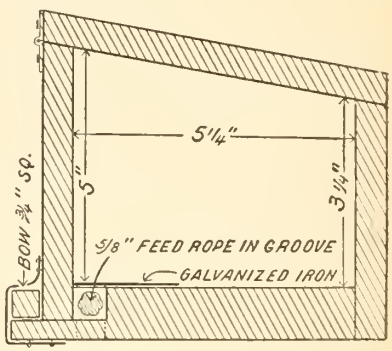

FIG. 3.—Cross section of the box of the land-plaster distributer shown in figure 2. The box is tilted forward so that the plaster will slide to the lower front edge. Because of this position the back of the box is not as high as the front.

The board forming the back of the box is three-fourths of an inch thick and 4½ inches wide. It is nailed to the back edge of the bottom. The end boards are 1 inch thick, 5¼ inches long on the bottom edge, 3¼ inches wide on the back end, and 5 inches wide on the front end. To keep the plaster dry, the box is covered with a light lid.

The bow is 15 feet long. The heads of the bow are three-fourths of an inch thick, 1⅝ inches wide, and 4 inches long. The body of the bow between the heads is three-fourths of an inch square and 14 feet 4 inches long. A ⅝-inch rope is put through the groove in the box and stretched across the heads of the bow, which lies in place on the rabbeted lip of the bottom. The rope is permanently fastened to one end of the bow. As the rope will stretch, it is necessary to fasten it to the other end in such a way that it may be tightened. It may be passed around the head of the bow and tacked temporarily. A better way is to securely fasten across the end of the bow a piece of iron with a ⅝-inch hole in one end. The end of the iron with the hole in it projects beyond the edge of the bow enough to permit the rope to pass through the hole. The rope is then tightened and held in place by driving a hardwood wedge into the hole beside it.

Figure 2 shows the box attached to the cart. Scantling are bolted to the under side of the shafts. They rest on the axle and project far enough behind the cart to furnish support for the box. Wedges are placed under the back of the box to tilt it forward enough to cause the plaster to slide to the front edge. A 12-inch board is bolted across the scantling between the box and the wheels of the cart. This is to support the lever that moves the bow back and forth. The front edge of the board is raised by means of wedges to give the lever its proper position.

The bow is moved back and forth by means of a lever that gets its impetus from one of the wheels. The lever consists of two pieces, one being about 4 inches shorter than the other. The two pieces of the lever are fastened together by means of a thin, flat piece of iron. The right-hand margin of the iron plate is securely fastened with screws to the long piece of the lever where the latter passes over the supporting board. Half-inch holes three-fourths of an inch apart pass through the iron plate, the long piece of the lever, and the supporting board. The lever is held in position on the 12-inch board upon which it rests by means of the pivotal pin and three clamps or guide plates, two on the left side and one on the right side. These guide plates are shown in figures 4 and 5. When in position they are fastened with screws to the 12-inch supporting board. The guide plate on the

right is about 11 inches long. It has half-inch holes three-fourths of an inch apart in its left margin, through which the pivotal pin passes. The length of the stroke of the lever is controlled by changing the position of the pivotal pin in these holes. The lower left-hand corner of the plate is bolted to the lower end of the short piece of the lever. In the upper left-hand corner of the plate of iron is a slot an inch long. This corner of the plate of iron is fastened to the short piece of the lever by means of a thumbscrew that passes through the slot. The upper ends of the two pieces of the lever have each a V-shaped iron guide attached with screws. Their position and shape are shown in figures 4 and 5.

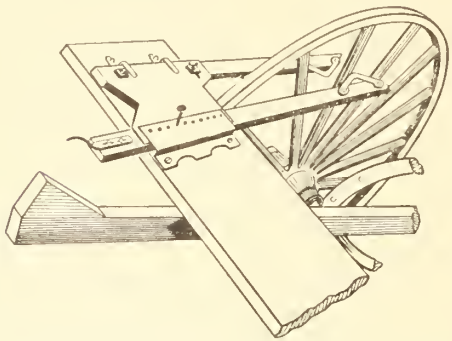

FIG. 4.—The lever of the land-plaster distributer shown in figure 2 complete as it rests upon the board that supports it. Three guide plates and a pivotal pin hold the lever in place. Two of these plates are on the left and one on the right. The one on the right has holes in its left margin through which the pivotal pin passes. On the upper ends of the two pieces of the lever are V-shaped guide plates. When the spokes strike these plates the lever moves back and forth. On the lower end of the lever is an iron that catches into the staple on the bow.

By means of the thumbscrews just described the guide plates are set just far enough apart to allow the spokes of the wheels to pass between them. Plates of iron are fastened to spokes where the guide plates rub, to prevent the spokes from being cut off.

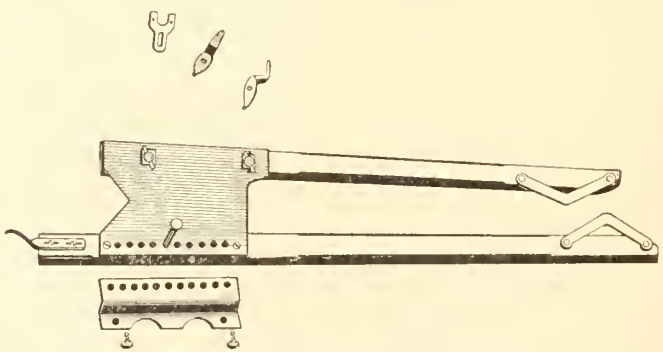

FIG. 5.—The lever of the land-plaster distributer shown in figure 2. The clamps, or guide plates, lie on either side of the lever. The staple, or socket, into which the iron on the lower end of the lever catches is shown at the left of the two small guide plates. It is fastened to the bow with screws.

The piece of iron that is bolted to the lower end of the lever projects far enough to catch into a socket or staple fastened to the bow. As the spokes of the wheel strike the guide plates the lever is moved

back and forth. The lever in turn moves the bow. The longer the stroke the greater the amount of plaster sown, and vice versa. After the rope on the bow has been used for some time it gets full of plaster and the feed is diminished slightly. A rope will sow about 100 acres. It should then be cleaned or replaced with a new one.

From the illustrations of this device for distributing land plaster it will be seen that it can be attached to a buggy or the hind wheels of the running gear of a wagon. It can also be mounted upon a pair of wheels by letting the scantling upon which the box rests extend forward far enough to serve as shafts. The wheelbarrow grass seeder is one of the best devices for sowing clover seed. A farmer who needs a plaster distributer will doubtless need a grass seeder also. We would advise those contemplating the construction of this implement to get the wheelbarrow grass seeder first. With it to look at and the descriptions given herewith the construction of a plaster distributer should be a simple matter.

In order that this implement may do perfect work, the land plaster should be dry and thoroughly pulverized. Difficulty is sometimes experienced in distributing plaster that is damp and full of lumps and small pieces of unerushed rock. Putting the plaster through a sieve to remove the lumps and pieces of unerushed rock materially aids in its distribution.

OLSON'S LAND-PLASTER DISTRIBUTER.

Some five years ago Mr. Charles Olson, of Washington County, Oreg., undertook the task of making a satisfactory implement for distributing land plaster. Since then a local smith has constructed several of these implements, and the original has been improved in several particulars.

Figure 6 illustrates this distributer. It consists of a long box, or hopper, mounted on an old pair of mower wheels. A large square shaft revolves in the bottom of the box to agitate the plaster. The implement has a tongue and is drawn by two horses. The box is shaped very much like the box of an ordinary grain drill. It is 11 feet long, but can be made any length desired. The bottom of the box is 1¾ inches thick, 5½ inches wide, and 11 feet 10 inches long, thus projecting far enough beyond the ends of the box to furnish support

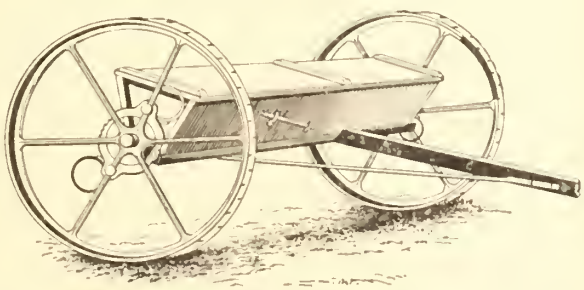

FIG. 6.—An implement for distributing land plaster devised by Mr. Charles Olson, of Washington County, Oreg.

for the bearings. The front and back pieces of the box are 1¼ inches thick and 11 inches wide. The lower edges of the side pieces rest on top of the bottom piece. The ends of the box are 1¼ inches thick. Each end consists of two pieces. The lower piece is about 1 inch wide and has a half circle cut in the middle of its upper edge. The upper piece has a half circle cut in the middle of its lower edge. When the two pieces are put together they form a circular hole, through which the shaft passes. The end pieces fit the shaft snugly, so that the plaster will not work out. The ends fit in grooves cut in the side pieces. They are held in place by small iron rods that run across the box. To protect the plaster during showers the box is provided with a lid 13 inches wide.

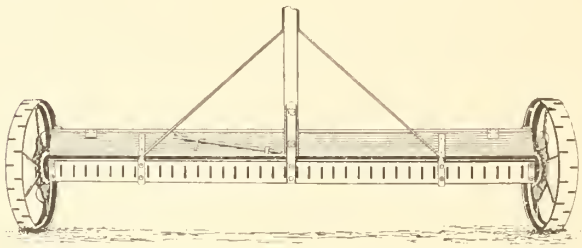

FIG. 7.—Bottom view of Olson land-plaster distributer, showing the holes in the box through which the plaster passes and the attachment of the tongue and its braces to the box. The lever for adjusting the feed, carried in straps on the front of the box, is also shown.

Holes for the plaster to pass through are cut in the bottom of the box. (See fig. 7.) These are three-eighths of an inch wide, 2¼ inches long, and 3 inches apart. These holes run across the box—that is, the length of the holes is at right angles to the length of the box. On the under side the holes are about an inch wide. A piece of galvanized iron with holes corresponding to those just described is placed in the bottom of the box in such a way as to form a curved bottom. (See fig. 8, which shows a cross section of the box.) This piece of galvanized iron is 8 inches wide and is as long as the inside of the box. Its edges are nailed to the sides. Another piece of galvanized iron 10 inches wide, with corresponding feed holes, fits snugly over the stationary one fastened in the bottom of the box. This upper piece of iron is movable lengthwise of the box. Its edges pass up the sides

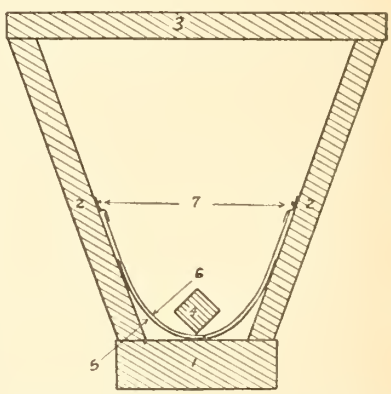

FIG. 8.—Cross section of the box of the land-plaster distributer shown in figure 6: 1, bottom; 2, sides; 3, top, or lid; 4, square shaft that revolves in the bottom of the box; 5, stationary sheet of galvanized iron; 6, movable sheet of galvanized iron; 7, cleats that hold the upper sheet of galvanized iron in place.

of the box and are covered by cleats. The cleats are narrow strips of galvanized iron 1½ inches wide nailed to the sides of the box. They are bent in the middle to give room for the edges of the sheet of galvanized iron they cover. It will be seen that the upper piece of galvanized iron is held in place by the cleats only and can be moved lengthwise in either direction to open or close the feed holes.

The wheels of the implement are old mower wheels. A large iron shaft runs through the bottom of the box and connects the two wheels. At the ends this shaft is cylindrical, but on the inside it is 1¼ inches square. The turning of this square rod in the bottom of the box constantly works the plaster out through the feed holes and keeps it from packing in the bottom of the box. In fact, the turning of this square shaft in the bottom of the box is one of the essential features of the implement. It must be perfectly square and be so located that the corners will just touch the galvanized iron when it turns. Another point very essential to observe in the construction of this implement is making the holes in the two pieces of galvanized iron. They must exactly correspond. If they do not, some of the feed holes will be larger than others and the plaster will be distributed unevenly. After the holes have been cut the two pieces of galvanized iron are riveted together, put into a vise, and the margins of the holes are filed until they exactly correspond, after which they are taken apart and placed in the feed box, as already indicated.

In the middle of the box, just over the large shaft that revolves, a bar of iron one-half of an inch square passes across the box. The ends of this bar are split, flattened out, and riveted to the top sheet of galvanized iron just below the cleats already described. The split ends of the bar are 7 or 8 inches long to give the union strength. Just over the square half-inch bar of iron a flat bar of iron 2 inches wide with a hole in its center is bolted across the top of the box. By running a lever down through this hole and prying on the half-inch bar of iron the upper sheet of galvanized iron may be slid either way, thus opening or closing the feed holes. The lever used for this purpose is a flat piece of iron 2 feet long, three-eighths of an inch thick, and 1 inch wide. In the lower end of the lever is a half-inch notch that permits the lever to slip over the half-inch bar of iron. (See figs. 8 and 9.)

As previously stated, the bottom piece of the box projects beyond the ends. Upon these projections the bearings for the shaft are bolted. The shaft is round until it passes through the end of the box, and for about 2 inches at the middle point; elsewhere it is square and revolves in the bottom of the box. There is a bearing in the center of the box where the shaft is made cylindrical, a broad staple being driven down over the shaft. This staple passes through the bottom

and an iron plate that is fastened underneath the tongue. It is fastened below with nuts. This center bearing is necessary to take the "shake" out of the shaft and hold it in place so that it will rub the bottom just right. In addition to being bolted to the bottom the tongue has iron braces on either side. To keep the box from spreading there are two iron stirrups that fit on the under side of the box. The stirrups and side braces of the tongue are bolted to the bottom of the box (fig. 7).

The wheels of all these implements that have been made have been taken from old mowers. The wheels best suited for the purpose are those provided with ratchet wheels into which pawls or catches drop and cause the shaft to revolve when the implement is moving forward. Only one ratchet wheel is necessary if the implement is driven around the field to be plastered, with the ratchet wheel on the outside. Some means should be provided for raising the catches that drop into the ratchet wheels so that the shaft will not revolve when going to and from the field. Otherwise it will be necessary to close the feed holes.

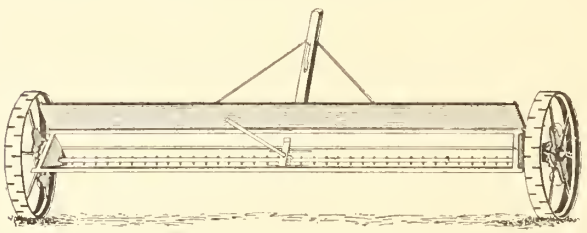

FIG. 9.—Inside view of the box of the land-plaster distributer illustrated in figure 6, showing the feed holes, the square rod that revolves in the bottom of the box, and the position of the lever when used in slipping the upper sheet of galvanized iron to open or close the feed holes.

If wheels with ratchets are not to be had a hole may be drilled through the shaft and the hub of one of the wheels. The shaft will be revolved by putting a pin through this hole. The implement should then be driven around the field with this wheel on the outside, so that the plaster will be sown when turning the corners. When taking the implement from one place to another the pin in the end of the hub can be removed. With the pin out the shaft will not turn, and little or no plaster will be sown.

The construction of this distributer costs from $35 to $40. The help of a smith is necessary. This is a very efficient implement, and so far as the writer knows fails to work only when the plaster is very damp. When the plaster is in this condition it sticks to the feed rod and does not go through evenly. Under these conditions it is necessary to spread the plaster in the sun to dry. With this machine it is not necessary to screen lumpy plaster. The lumps are pulverized by the feed rod.

END-GATE SEEDERS.

A number of farmers are using end-gate seeders for sowing land plaster. One of these seeders is easily attached to a wagon, the board to which it is bolted being the same in width and length as the end gate of the wagon box. If the plaster is dry and the air still, end gate seeders do fairly good work. If the plaster is damp it gives some trouble by packing in the feed hopper. The machine being so high above the ground, it is difficult to sow the plaster successfully when the wind is strong. It is best to drive at right angles to the direction in which the wind is blowing. The worker can then keep himself reasonably free from the dust.

Most of the end-gate seeders used for sowing land plaster have but one fan. Mr. C. R. Widmer, of Benton County, Oreg., uses a double fan machine with a clover-seeder attachment. The seeder is attached to a cart made from the hind wheels of an old wagon. The coupling is replaced by a pole that serves as a tongue. The side pieces of the box are 2 inches thick, 12 inches wide, and 6 feet long, and the box projects behind the axle about half its length. It is swung under the axle by means of stirrups. The front ends of the side pieces of the box are bolted to a 2-by-6-inch scantling that crosses beneath the hounds. A bottom is placed in that portion of the box behind the axle. On the front part of the cart is a seat for the driver. The board to which the seeder is attached forms the end gate of the box. When the seeder is mounted on a cart in this way the fans that throw the plaster are just 18 inches above the ground, and the effect of the wind on the plaster is much less than when the machine is attached to a wagon box. A cart similar to the one just described but differing in some details is shown in figure 10.

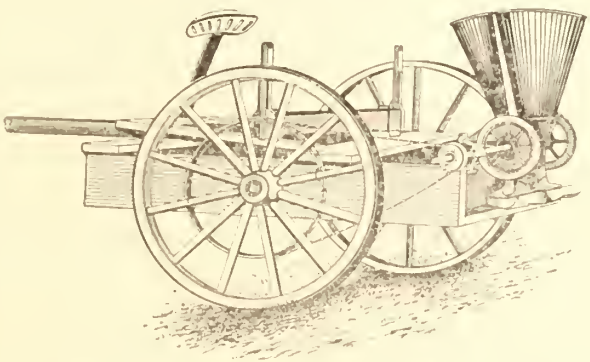

FIG. 10.—A double fan end gate seeder attached to the hind wheels of a wagon. Used by Mr. C. R. Widmer, Benton County, Oreg.

This double-fan seeder has a force feed, and little trouble is experienced with clogging unless the plaster is damp. When it clogs a light tap on the hopper usually starts the feed again. The machine has two hoppers, one for grain and the other for clover seed. The

plaster is sown from the clover-seed hopper. About 35 pounds of plaster can be placed in the hopper at a time. The machine mounted on a cart as described sows a strip 10 feet wide. A marker at the side of the cart indicates the next place to drive. All of these implements do better work if the plaster is put through a sieve to take out the small pieces of uncrushed rock.

SUMMARY.

(1) Land plaster has been found of great value in increasing the yield of leguminous crops in western Oregon and western Washington.

(2) It is very difficult to distribute land plaster evenly by hand. Parts of the field will receive too much plaster and parts will not receive enough. Where there is too much plaster the growth may be so rank that the clover falls before it can be harvested. Where there is not enough plaster the growth is seldom what it should be. It is a conservative estimate to say that clover will yield one-half ton more hay per acre where the plaster is distributed evenly than where it is distributed unevenly.

(3) Most men apply more plaster than is necessary when sowing it by hand. An implement that distributes the plaster evenly will usually save 20 to 50 pounds to the acre.

(4) Where the plaster is evenly distributed the crop comes on vigorously and quite evenly all over the field and holds the weeds in check. Sorrel, grasses, and other weeds usually give considerable trouble to clover and alfalfa where no plaster is used or where the distribution is uneven.

(5) Sowing plaster by hand is an unpleasant task. Men are scarce who can apply it evenly, and few hired men can be trusted to do it. For these reasons the farmer has to do it himself. A good implement for distributing land plaster makes it possible for anyone to do the work who can drive a team. Farmers have been found in different localities who have worked out some very satisfactory devices for this purpose. Detailed descriptions with drawings are given for three of these devices.

Approved:

JAMES WILSON,
Secretary of Agriculture.

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